A
cute pancreatitis, an
acute inflammatory
condition, is thought to
be due to activation of
enzymes in the pancre-
atic acinar cells, with inflammation
spreading into the surrounding tis-
sues. According to the National
Digestive Diseases Information
Clearinghouse Web site, the incidence
of acute pancreatitis is 17 new cases
per 100,000 persons in the United

Early nutritional support plays an
important role in preventing serious
complications and ensuring optimal
recovery in patients with acute pan-
creatitis and malnutrition. Patients
who cannot tolerate oral feeding are
given either enteral or parenteral
nutrition. In enteral nutrition, nutri-
tional formula is administered into a
feeding tube placed into the stom-
ach or small intestine. In parenteral
nutrition, nutritional formula is deliv-
ered directly into the blood through
a catheter in a vein. The key difference
between these 2 types of nutrition is
the degree of invasiveness, which is
greater for parenteral nutrition.

Traditionally, patients with acute
pancreatitis were either treated with
strict bowel rest or given parenteral
nutrition to allow the pancreas to
“rest” until the serum enzyme levels
returned to normal. Unfortunately,
some disadvantages are associated
with the use of parenteral nutrition;
one of the most serious is catheter-
related sepsis. Currently, enteral
nutrition is preferred for patients
with acute and severe pancreatitis
because it is more cost-effective than

PRIME POINTS

- The incidence of acute pancreatitis is 17 new cases per 100,000 persons in the United States.
- Initial management of patients with severe acute pancreatitis usually requires intensive care treatment and nutritional support.
- Enteral nutrition is preferred because it is more cost-effective than parenteral nutrition and results in fewer complications.

CE: Continuing Education

This article has been designated for CE credit. A closed-book, multiple-choice examination follows this article, which tests your knowledge of the following objectives:

1. Describe the significance of nutritional support therapy for patients with acute pancreatitis
2. Summarize recent research findings related to nutritional support therapy in acute pancreatitis and their implications for critical-care nursing practice
3. Compare and contrast enteral and parenteral nutrition as nutritional support therapies for patients with acute pancreatitis

Elaine Siow, RN, MSN, CRNP, BC

Enteral Versus Parenteral Nutrition for Acute Pancreatitis
Acute Pancreatitis

Pancreatitis is often associated with biliary tract disease or heavy alcohol intake. To date, the pathogenesis of pancreatitis remains poorly understood, and no specific proven treatment is available. According to Banks et al., the pathophysiology of acute pancreatitis has 3 phases: (1) premature activation of trypsin within the pancreatic acinar cells, which activates the pancreatic digestive enzymes; (2) intrapancreatic inflammation due to the activation of pancreatic digestive enzymes; and (3) extrapancreatic inflammation that may be manifested as severe complications such as acute respiratory syndrome.

Patients with acute pancreatitis typically have an abrupt onset of deep epigastric pain that radiates to the back. Nausea and vomiting are also usually present. On physical examination, abdominal distension, tenderness in the upper part of the abdomen, lack of bowel sounds, and occasionally a palpable pseudocyst mass are noted.

Pancreatic infection may develop in patients with acute pancreatitis as a result of widespread inflammatory mediators that may cause extravasations as a result of intravascular fluid shifts into third spaces. Examples of common pancreatic infectious processes include pseudocysts, pancreatic ascites, and pancreatic abscess. Pancreatic infection is a serious complication of acute pancreatitis, with a mortality rate as high as 4.8%, and an even higher rate of 13.5% in severe pancreatitis, within the first 2 weeks of hospitalization. In about 10% to 20% of patients, severe acute pancreatitis and serious pancreatic inflammation known as systemic inflammatory response syndrome develop, which further predispose the patient to more serious complications such as multiple-organ damage and pancreatic necrosis.

Although death is rare in acute pancreatitis, mortality rates of 80% occur in patients with severe acute pancreatitis because of complications. Early deaths are due to complications related to multiple-organ failure, whereas late deaths are mainly due to the complications associated with necrotizing pancreatitis. Because of the serious nature of severe acute pancreatitis, the initial management usually requires intensive care treatment and nutritional support.

Goal of Nutritional Support

Treatment for these patients with severe acute pancreatitis is largely supportive. The goal of nutritional support is to reduce the burden of disease. In more severe forms of acute pancreatitis, a negative nitrogen balance is often associated with poor clinical outcomes. The success of nutritional support is often determined by maintaining a positive nitrogen balance without overstimulating the secretion of pancreatic fluids. Prolonged fasting in patients with acute pancreatitis can exacerbate metabolic changes that may complicate recovery. More specifically, the extensive tissue destruction associated with acute pancreatitis may generate profound systemic metabolic derangement because of the release of hydrolytic enzymes, toxins, and cytokines, which adversely affect several organ systems and promote hypermetabolism with negative energy balance. Therefore, nutrition support is vital in improving outcomes in terms of reducing complications such as sepsis and infection in patients with severe and acute pancreatitis.

The optimal route of nutritional support in patients with acute pancreatitis is controversial. The use of parenteral nutrition can be complicated by problems such as catheter-related sepsis. In addition, the parenteral infusion of amino acids can indirectly stimulate secretion of gastric acids, which may in turn cause the release of pancreatic secretions into the surrounding tissues. The use of enteral nutrition is associated with the risk of proximal migration of the nasojejunal tube, which can cause gut contents to stimulate the release of pancreatic enzymes.
With parenteral nutrition, direct administration of the nutritional formula into the bloodstream results in the lack of gut use. This lack can cause bacterial translocation from the gut, which may further exacerbate inflammatory response in patients with severe acute pancreatitis. Patients may also be predisposed to a weaker gut-associated immune system as a result of changes to normal gut structure and intestinal microflora leading to more complicated morbidity issues. Enteral nutrition appears to be clinically beneficial because it encourages the rapid return of normal gut function and reduces the cytokine-generated stress response that occurs during an acute episode of pancreatitis.

**Literature Review**

Databases from Ovid MEDLINE, CINAHL, and PubMed were searched for relevant studies published from 1996 to 2006. The search strategy involved retrieving articles that contained the following key words: “enteral nutrition,” “parenteral nutrition,” and “acute pancreatitis.” Manual cross-referencing was also used to retrieve related articles. The search strategy generated 48 results. A total of 9 RCTs in which enteral and parenteral nutrition were compared were identified. Of these, 4 were excluded because of the lack of available data and/or the difficulty in consolidating the inferences because of the diverse outcomes that were examined. The outcomes in the 5 studies selected for review included mortality rates, complications, length of hospitalization, cost of nutritional support, and dietary improvement. Table 1 summarizes some of the characteristics of the participants in the studies.

Common causes of acute pancreatitis were chronic alcohol intake, gallstone-related diseases, and idiosyncratic causes. Methods of randomization were use of sealed numbered envelopes; sealed envelopes containing the words parenteral nutrition or the words enteral nutrition, and computer-generated assignment placed in sealed envelopes. In 2 studies, the authors did not indicate the randomization methods.

**Analyses of Findings**

The 5 RCTs reviewed generally addressed the relative cost and benefits of the enteral and parenteral nutrition interventions. In all the studies, the investigators evaluated patients with acute pancreatitis who were randomized to receive either mode of nutritional support, enteral nutrition or parenteral nutrition. Table 2 summarizes the findings in each of the 5 trials.

**Mortality Rates**

None of the studies yielded evidence of a difference in the mortality rates between patients given enteral

---

**Table 1** Characteristics of test subjects

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Kalfarentzos et al(^7)</th>
<th>McClave et al(^22)</th>
<th>Abou-Assi et al(^5)</th>
<th>Gupta et al(^14)</th>
<th>Louie et al(^8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>18</td>
<td>16</td>
<td>26</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>20</td>
<td>16</td>
<td>27</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Imrie criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>4.2</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>4.6</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>APACHE II score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>12.7</td>
<td>ND</td>
<td>ND</td>
<td>8</td>
<td>11.8</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>11.8</td>
<td>ND</td>
<td>ND</td>
<td>10</td>
<td>12.7</td>
</tr>
<tr>
<td>APACHE III score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>ND</td>
<td>17.5</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>ND</td>
<td>22.4</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Ranson’s criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>ND</td>
<td>1.3</td>
<td>3.1</td>
<td>ND</td>
<td>4.7</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>ND</td>
<td>1.3</td>
<td>2.5</td>
<td>ND</td>
<td>5.0</td>
</tr>
<tr>
<td>Severity of pancreatitis</td>
<td>Severe</td>
<td>Mild, on average, for patients</td>
<td>Mild in 87% of patients, moderate in 10%, severe in 3%</td>
<td>Severe</td>
<td>Severe</td>
</tr>
</tbody>
</table>

Abbreviations: APACHE, Acute Physiology and Chronic Health Evaluation; ND, no data.
nutrition and patients given parenteral nutrition. Louie et al\textsuperscript{8} reported no deaths among patients given enteral nutrition and 3 deaths among patients given parenteral nutrition. Those deaths, however, were attributed to complications of pancreatitis rather than to the mode of nutrition. Abou-Assi et al\textsuperscript{5} reported 8 deaths among patients given enteral nutrition and 6 deaths among patients given parenteral nutrition. Kalfarentzos et al\textsuperscript{7} reported 1 death among patients given enteral nutrition and 2 deaths among patients given parenteral nutrition. No deaths were reported in the other 2 studies.\textsuperscript{14,22}

### Complications

In all 5 studies, higher overall complications were generally reported among patients given parenteral nutrition than among patients given enteral nutrition. Kalfarentzos et al\textsuperscript{7} reported a significantly lower total number of complications for patients given enteral nutrition compared with patients given parenteral nutrition. Complications such as sepsis, nosocomial infection, catheter-related infection, and hyperglycemia are common findings in all studies, especially in patients who were

### Table 2  Summary of outcomes in reviewed studies

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Kalfarentzos et al\textsuperscript{7}</th>
<th>McClave et al\textsuperscript{22}</th>
<th>Abou-Assi et al\textsuperscript{5}</th>
<th>Gupta et al\textsuperscript{14}</th>
<th>Louie et al\textsuperscript{8}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Death</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>5.5%</td>
<td>0%</td>
<td>30.7%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>10%</td>
<td>0%</td>
<td>22.2%</td>
<td>0%</td>
<td>16.6%</td>
</tr>
<tr>
<td>$P$</td>
<td>NT</td>
<td>&gt;.99</td>
<td>NS</td>
<td>&gt;.99</td>
<td>NT</td>
</tr>
<tr>
<td><strong>Sepsis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>27.8%</td>
<td>12.5%</td>
<td>3.8%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>50%</td>
<td>12.5%</td>
<td>33.3%</td>
<td>22.2%</td>
<td>27.8%</td>
</tr>
<tr>
<td>$P$</td>
<td>&lt;.01</td>
<td>&gt;.99</td>
<td>.01</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td><strong>Hyperglycemia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>77.8%</td>
<td>25%</td>
<td>15.4%</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>90%</td>
<td>31.3%</td>
<td>51.9%</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>$P$</td>
<td>NT</td>
<td>NT</td>
<td>.03</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td><strong>Diarrhea</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>33.3%</td>
<td>ND</td>
<td>ND</td>
<td>25%</td>
<td>50%</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>15%</td>
<td>ND</td>
<td>ND</td>
<td>11.1%</td>
<td>0%</td>
</tr>
<tr>
<td>$P$</td>
<td>NT</td>
<td>ND</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td><strong>Days of hospitalization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>40</td>
<td>9.7</td>
<td>14.2</td>
<td>7</td>
<td>26.2</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>39</td>
<td>11.9</td>
<td>18.4</td>
<td>10</td>
<td>40.3</td>
</tr>
<tr>
<td>$P$</td>
<td>NS</td>
<td>NS</td>
<td>.10</td>
<td>.05</td>
<td>NT</td>
</tr>
<tr>
<td><strong>Cost per patient</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>£30/d</td>
<td>£761</td>
<td>£394</td>
<td>£55</td>
<td>£1375</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>£100/d</td>
<td>£3294</td>
<td>£2756</td>
<td>£297</td>
<td>£2608</td>
</tr>
<tr>
<td>$P$</td>
<td>NT</td>
<td>&lt;.01</td>
<td>.004</td>
<td>NT</td>
<td>.08</td>
</tr>
<tr>
<td><strong>Dietary improvement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days on nutritional support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>34.8</td>
<td>ND</td>
<td>6.7</td>
<td>2</td>
<td>13.1</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>32.8</td>
<td>ND</td>
<td>10.8</td>
<td>4</td>
<td>14.6</td>
</tr>
<tr>
<td>$P$</td>
<td>NT</td>
<td>ND</td>
<td>.03</td>
<td>NT</td>
<td>.70</td>
</tr>
<tr>
<td><strong>Days to oral diet</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteral nutrition</td>
<td>ND</td>
<td>5.6</td>
<td>80%\textsuperscript{c}</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>ND</td>
<td>7.1</td>
<td>63%\textsuperscript{c}</td>
<td>3</td>
<td>15.9</td>
</tr>
<tr>
<td>$P$</td>
<td>ND</td>
<td>ND</td>
<td>NT</td>
<td>.02</td>
<td>.80</td>
</tr>
</tbody>
</table>

Abbreviations: ND, no data; NS, not significant, but $P$ value not provided in article; NT, not tested.

\textsuperscript{a} All percentages refer to the percentages of patients within each group.

\textsuperscript{b} Costs for patients receiving enteral nutrition using only 1 nasojejunal tube.

\textsuperscript{c} Percentage of patients who advanced to oral diet without problems.
given parenteral nutrition. Abou-Assi et al showed a significant difference in rates of catheter-related infections between patients given parenteral nutrition and patients given enteral nutrition. The patients with infections eventually required removal of the venous catheter and antibiotic treatment. McClave et al, on the other hand, observed equal proportions of nosocomial infections in both the enteral and the parenteral nutrition groups.

Glucose control can be difficult in acute pancreatitis because endocrine and exocrine functions are compromised. Hyperglycemia can occur as a result of the use of enteral nutrition (which involves the infusion of complex carbohydrates) because compromised exocrine functions result in increased secretion of digestive enzymes, a situation that leads to the digestion of complex carbohydrates. Hyperglycemia can occur with parenteral nutrition (which involves the direct infusion of dextrose) because compromised endocrine functions reduce insulin secretion, which is required for the absorption of dextrose.

Hyperglycemia was more prevalent in patients given parenteral nutrition than in patients given enteral nutrition. This disparity is a cause of concern for practitioners who manage these patients because prolonged uncontrolled hyperglycemia increases the risk of infectious complications and contributes to the incidence of fluid and electrolyte imbalances. Louie et al found that the mean number of days of elevated blood glucose levels was 2.7 in the enteral nutrition group and 3.6 in the parenteral nutrition group, but the difference was not significant. McClave et al provided no evidence that most patients in the intensive care unit will receive intensive insulin therapy. As a result, it is not clear that the use of enteral nutrition will lead to fewer occurrences of hyperglycemia than would parenteral nutrition in current practice.

Transient diarrhea is a minor nutrition-related occurrence. Kalfarentzos et al, Gupta et al, and Louie et al found that patients who were receiving enteral nutrition had transient diarrhea after institution of enteral nutrition. These researchers, however, did not determine the significance of the difference between the enteral nutrition and the parenteral nutrition groups.

Dietary Improvement

One indication of the resolution of acute pancreatitis is dietary improvement. Generally, the patients in the 5 studies who were given enteral nutrition required fewer days of nutritional support and fewer days to the start of oral diet than did the patients who received parenteral nutrition.

Abou-Assi et al showed significant evidence that the patients given enteral nutrition received 4.1 fewer days of nutritional support than did the patients given parenteral nutrition. After disease resolution, 80% of the patients in the enteral nutrition group progressed to oral diet without problem, compared with 63% in the group receiving parenteral nutrition.
nutrition. In the study by Gupta et al,\textsuperscript{14} patients received enteral nutrition for a median of 2 days and parenteral nutrition for a median of 4 days; the significance of any difference between the 2 groups was not determined. Gupta et al\textsuperscript{14} also found significant evidence that the patients who received enteral nutrition progressed to full oral feeding a day earlier than did the patients who received parenteral nutrition.

Louie et al\textsuperscript{8} found no significant difference between the patients in the enteral nutrition and parenteral nutrition groups, in terms of the duration of nutritional support and the start of oral feeding. Kalfarentzos et al\textsuperscript{7} similarly found no difference in the duration of nutritional support between the enteral and the parenteral nutrition groups.

**Length of Hospitalization**

Evidence of the effects of nutritional support on the length of hospitalization was mixed. Abou-Assi et al,\textsuperscript{5} Kalfarentzos et al,\textsuperscript{7} and McClave et al\textsuperscript{22} found no differences in the mean length of hospital stay among the patients in the enteral nutrition group and the parenteral nutrition group. Only Gupta et al\textsuperscript{14} found a significant difference between the 2 groups; patients in the enteral nutrition group were hospitalized for 3 fewer days than were patients in the parenteral nutrition group.

**Cost of Nutritional Support**

All 5 RCTs documented that enteral nutrition is cheaper than parenteral nutrition in patients with acute pancreatitis. Comparing the results across the different studies is difficult because nutritional support costs were measured differently (eg, different cost components were included) in the various studies.

McClave et al\textsuperscript{22} found a significant difference in the mean cost of nutritional support among patients given parenteral nutrition ($3294 per patient) and patients given enteral nutrition ($761 per patient). Kalfarentzos et al\textsuperscript{7} stated, without statistical testing, that the cost of enteral nutrition was about £30/d and the cost of parenteral nutrition was about £100/d. Similarly, Gupta et al\textsuperscript{14} stated without statistical testing that the mean cost of enteral nutrition was £55 per person and the cost of parenteral nutrition was £297 per person. Abou-Assi et al\textsuperscript{5} showed a significantly lower mean cost of nutritional support in patients given enteral nutrition ($394 per person) than in patients given parenteral nutrition ($2756 per person). The lower daily costs in the enteral nutrition group were due to the combination of lower daily hospitalization costs ($23.30/d vs $222/d) and the shorter duration of nutritional support (6.7 days vs 10.8 days). Finally, Louie et al\textsuperscript{8} found no significant difference in the mean cost per person of enteral nutrition ($1375) and parenteral nutrition ($2608). Among the 5 studies, the cost for patients receiving enteral nutrition was highest in the study by Louie et al,\textsuperscript{8} possibly because of the high reported rates of dislodgment (>90%) of nasojejunal tubes. However, when only a single nasojejunal tube was used, the cost of enteral nutrition was lower at $957 and differed significantly from the cost of parenteral nutrition.

**Summary of Findings**

The 5 RCTs reviewed indicated that patients with acute pancreatitis can receive nutritional support by either enteral or parenteral nutrition. The studies generally provided some evidence that enteral nutrition is better than parenteral nutrition. The benefits of using enteral nutrition include the lower overall complication rates in patients who were given enteral nutrition compared with patients given parenteral nutrition.\textsuperscript{5,7} The studies also yielded significant evidence that enteral nutrition is much less expensive to implement than is parenteral nutrition, even though the cost measures in the studies differed.\textsuperscript{5,8,22}

Patients in both enteral and parenteral nutrition groups progressed in dietary improvement with the use of nutritional support. When enteral nutrition is compared with parenteral nutrition, the studies provide some evidence that enteral nutrition hastens dietary improvement in terms of fewer days receiving nutritional...
support and fewer days to start of oral intake. Gupta et al provided significant evidence that patients given enteral nutrition require a shorter length of hospitalization than do patients given parenteral nutrition. The 5 studies, however, did not provide evidence of significant differences in the mortality rates between the 2 groups.

The review of the 5 RCTs reflects the changing concepts in the use of nutritional support in patients with acute pancreatitis, of which nurses should be mindful. The studies do, however, have limitations. First, the small sample sizes may explain why many results were not statistically significant. Second, the lack of standardized outcome parameters across the studies makes it difficult to compare the studies. For instance, incidences of hyperglycemia were measured in both number of days of hyperglycemic events and number of patients being treated for hyperglycemia. Finally, changes in current practice, such as tighter glucose control, may reduce the relevance of some of the findings.

**Implications for Nursing**

The RCTs reviewed indicate that enteral nutrition is a better nutritional treatment than is parenteral nutrition for patients with acute pancreatitis. This conclusion is consistent with the guidelines published by the American Society for Parenteral and Enteral Nutrition (ASPEN) and the American College of Gastroenterology (ACG). The ASPEN guidelines focus on the use of enteral and parenteral nutrition among adults and children. The ACG guidelines are for the diagnosis and treatment of acute pancreatitis in adults. Both guidelines are in favor of the use of enteral nutrition as the initial route of specialized nutritional support for patients with acute pancreatitis who require nutritional support. These guidelines recommend that parenteral nutrition should be used only when a patient cannot tolerate enteral nutrition. The ACG guidelines also state that parenteral nutrition is not usually the first line of nutritional support because of its low cost-effectiveness and the morbidity associated with its use.

The ASPEN guidelines recommend that practitioners avoid routine use of nutritional support in patients with mild to moderate acute pancreatitis. The ACG guidelines note that patients with a milder form of acute pancreatitis do not often have malnutrition on admission and would be able to tolerate oral intake within 3 to 7 days of hospitalization. The ACG guidelines suggest that nutritional support can be used to treat malnutrition when patients with acute pancreatitis do not tolerate oral intake within a week.

As noted by McClave et al, nutritional intervention in malnourished patients with severe acute pancreatitis provides patients an opportunity to recover from the course of the disease, reduces complications, attenuates oxidative stress, and promotes faster recovery and resolution of the disease process. The ACG guidelines recommend the use of enteral nutrition in patients with acute severe necrotizing pancreatitis because of the benefits of enteral nutrition in stabilizing gut barrier function. Maintaining the gut barrier function is necessary to prevent complications associated with intestinal vulnerability to bacterial infection associated with a lack of oral feeding. In addition, the guidelines also suggest that patients with subtotal and total necrotizing pancreatitis should be given proton pump inhibitors daily to reduce susceptibility to duodenal ulcers. The ASPEN guidelines also emphasize that practitioners should be able to recognize when patients have severe malnutrition and refer the patients to professionals who can perform formal nutritional screening to address the patients' nutritional needs.

Although the guidelines are extremely useful and an important starting point for determining the optimal route of nutrition for patients with acute pancreatitis, it is important for clinicians to evaluate the needs and clinical situation of each patient before making the final decision.

**Role of Critical Care Nurses**

The decision to administer nutritional support to patients with acute pancreatitis is a relevant topic for critical care nurses involved in the care of patients with gastrointestinal diseases. Nurses must stay up-to-date with the current knowledge of clinical issues related to nutritional management and be aware of the relative clinical outcomes of using enteral and parenteral nutrition. Nurses can affect patients' care in the following ways.

First, nurses can play a pivotal role in the care of patients with acute pancreatitis by informing patients and patients' families of the various nutritional support options available. For example, nurses can engage in evidence-based nursing by conveying a summary of the recent evidence on enteral and parenteral nutrition, especially the relative costs and benefits of the 2 methods.
Communicating information to patients and patients’ families is important; it may help alleviate stress and anxiety by allowing patients to make independent and well-informed decisions throughout the disease process.26

Second, nurses can promote quality practice and contribute to important decisions that can influence patients’ outcomes by being actively involved in providing useful recommendations to the health care team on the appropriate route of nutrition support for patients with acute pancreatitis. Nurses must develop a professional collaboration with other members of the health care team through the nurses’ knowledge of recent research evidence. The combined knowledge of the various health care disciplines in treating patients may lead to improved quality of care, quality of life, and cost-effectiveness of health care delivery.27 Nurses can contribute to the knowledge base of the health care team by providing suggestions on nutritional support options during patient rounds with the team.

Nurses can also propose the creation of a practice guidelines committee consisting of physicians, nurses, and dietitians to address nutritional support issues in patients with acute pancreatitis. Practice guidelines can be developed by synthesizing current research findings in the form of a clinical algorithm. Such clinical algorithms are meant to assist practitioners in the management of patients with acute pancreatitis. Because a range of options is available in any clinical situation, nurses should be flexible in prescribing the appropriate route of nutritional support according to the needs of the patient. For instance, nurses as competent health care providers should use appropriate clinical judgment in complicated clinical situations to ensure that patients’ safety and needs are not compromised.

Algorithm for Nutritional Support for Patients With Acute Pancreatitis

The Figure shows an algorithm for nutritional management in patients with acute pancreatitis that reflects the knowledge synthesized from current research. Nurses who are managing patients with acute pancreatitis may consider the following recommendations to current practice:

1. In patients with severe acute pancreatitis, enteral nutrition clearly is preferred to parenteral nutrition.
2. Nurses should know how to identify early predictors of acute pancreatitis by using reliable scoring systems such as the Ranson criteria and Acute Physiology and Chronic Health Evaluation (APACHE) II that can indicate the severity of a patient’s acute pancreatitis within 48 hours of the patient’s admission. The Ranson criteria are a clinical tool to predict the severity of acute pancreatitis. The tool uses parameters such as age and white blood cell count at admission and hematocrit and serum level of urea nitrogen 48 hours after admission. APACHE II is a point score system used to classify severity of disease in the intensive care unit. It uses 12 routine physiological measurements such as blood pressure, body temperature, and heart rate during the first 24 hours after admission.
3. Not all patients with acute pancreatitis require nutritional support.28 The ASPEN guidelines suggest that practitioners should not routinely use nutritional support in patients with mild to moderate acute pancreatitis because such support is not cost-effective and can lead to unwarranted infectious complications.
4. Patients experiencing mild to moderate acute pancreatitis should not be given oral feedings and infusions of intravenous fluids for 48 hours from the time of hospital admission. Patients should be reassessed for abnormally elevated levels of inflammatory stress markers before
**Chief signs and symptoms**
Severe epigastric pain, nausea, and vomiting

**Diagnosis**
History of present illness and findings on physical examination
Abdominal ultrasound
Ranson criteria, APACHE II score
Complete blood cell count, biochemical tests, serum levels of amylase, lipase, C-reactive protein, calcium, liver enzymes, triglycerides

(Confirmatory radiological imaging for acute pancreatitis)

**Differential diagnoses**
For example, acute pancreatitis, acute gallbladder disease, perforated ulcer, acute intestinal obstruction, acute mesenteric vascular obstruction, renal colic, appendicitis

**APACHE II score <8**
Ranson criteria <3
Minimal organ failure/local complications

**APACHE II score ≥8**
Ranson criteria ≥3
Organ failure/local complications

**Mild/moderate acute pancreatitis**

**Severe acute pancreatitis**

**Assess for malnutrition**
History of present illness and findings on physical examination
Serum levels of protein, albumin

**First 48 hours**
Nothing by mouth, intravenous fluids, bed rest, pain relief

Pain-free, (+) bowel sounds

Start minimal oral fluids to determine tolerance of oral intake

Gradually increase intake

Tolerate solid foods
Check pancreatic enzymes, metabolic panel
Discharge home

**Refer to dietitian for full nutritional assessment**

**Unable to resume oral intake by 1 week**

**Insert nasojejunal/Dobbhoff tube, start enteral nutrition within 48 hours**

**(+ Tolerate)**
Continue until start of oral intake

**(+ Tolerate parenteral nutrition)**
Switch to parenteral nutrition

**(- Tolerate)**

**(+ Malnutrition)**

**(- Malnutrition)**

**Figure**
Algorithm for nutritional support in patients with acute pancreatitis.

**Abbreviation:** APACHE II, Acute Physiology and Chronic Health Evaluation.

\(^a\) Data derived from Friedman.\(^1\)

\(^b\) Data derived from Banks et al.\(^10\)
nutritional support is started. If a patient’s condition does not improve, enteral nutrition should be started. If the patient’s condition improves after 48 hours of bowel rest and supportive fluid therapy, oral intake can be started slowly. Oral intake should generally begin with small amounts of clear fluids and then gradually be increased as the patient’s tolerance level increases.

5. In patients with preexisting malnutrition who have severe acute pancreatitis, early enteral nutrition is strongly recommended because it helps patients limit harmful catabolism that leads to the loss of lean body mass, modulate the acute process of acute pancreatitis, and reduce inflammatory stress responses. Starting enteral nutrition support within 48 hours of hospital admission is safe. On the other hand, parenteral nutrition started within 48 hours of admission may have an unfavorable effect on patients’ outcomes. Early referral to a dietitian is necessary to ensure that patients receive a formal nutrition assessment, so that patients’ nutritional needs can be addressed and met.

6. Most patients receive enteral nutrition via weighted nasogastric tubes such as Dobbhoff tubes or nasojejunal tubes. These tubes are safe to use and well tolerated by patients when the tubes are endoscopically positioned beyond the ligament of Treitz.

7. If a patient cannot tolerate enteral nutrition, then parenteral nutrition should be considered as the next option.

8. Nurses should continually monitor patients with acute pancreatitis to evaluate the effectiveness of nutritional therapy. Levels of C-reactive protein are a commonly used measurement to determine inflammatory responses in patients with acute pancreatitis. Plasma levels greater than 150 mg/L (to convert to nanomoles per liter, multiply by 9.524) within the first 72 hours of the disease are correlated with presence of necrosis. C-reactive protein levels can be correlated with diseases such as coronary artery disease, making the plasma concentration of C-reactive protein a sensitive but nonspecific marker of inflammation. Depending on the availability of laboratory tests, nurses could also use other tests, such as measurements of levels of trypsin, elastase, and phospholipase A2, which are sensitive and specific for the measurement of pancreatic enzyme levels. However, although biochemical values are useful in determining a patient’s status, nurses should not depend solely on biochemical measurements to evaluate the effectiveness of nutritional therapy. Other clinical information such as results of physical examination, computed tomography of the abdomen, use of standard scoring systems (eg, APACHE II score and Ranson criteria) are necessary to develop an appropriate treatment plan suited to each patient’s needs.

Summary
The studies reviewed for this article provide evidence that the use of enteral nutrition is better than the use of parenteral nutrition in the management of patients with acute pancreatitis. The AGA guidelines also support the use of enteral over parenteral nutrition in patients with acute pancreatitis.

Previously, the use of parenteral nutrition or withholding food and fluids by mouth was the general practice. To date, however, some practitioners are still skeptical about the use of enteral nutrition for fear of stimulating the pancreas and causing the patient’s clinical condition to worsen. Consistent with increasing evidence that enteral nutrition is the better form of nutritional support, current research indicates that the use of enteral nutrition is gaining favor over parenteral nutrition in the management of patients with acute pancreatitis. Knowledge from current research studies and guidelines are important because nurses can play an important role in the health care team by influencing the team to use the appropriate
route of nutritional support in patients with acute pancreatitis. 

Acknowledgments
The author thanks Therese Richmond, PhD, CRNP, of the University of Pennsylvania School of Nursing for her review of this manuscript.

Financial Disclosures
None reported.

References

http://ccn.aacnjournals.org
Enteral Versus Parenteral Nutrition for Acute Pancreatitis

**Facts**

- The incidence of acute pancreatitis is 17 new cases per 100,000 persons in the United States.
- Initial management of patients with severe acute pancreatitis usually requires intensive care treatment and nutritional support.
- Enteral nutrition is preferred because it is more cost-effective than parenteral nutrition and results in fewer complications.


This article and an online version of the CE test may be found at [http://ccn.aacnjournals.org](http://ccn.aacnjournals.org).
1. What is the key difference between parenteral and enteral nutrition?
   a. Parenteral nutrition is more invasive than enteral nutrition
   b. Parenteral nutrition can be initiated earlier than enteral nutrition
   c. Enteral nutrition is more cost-effective than parenteral nutrition
   d. Enteral nutrition is associated with lengthier hospital stays than parenteral nutrition
2. An abrupt onset of what symptom is most common in patients with acute pancreatitis?
   a. Jaundice
   b. Hyperglycemia
   c. Epigastric pain
   d. Dehydration
3. Death in cases of severe acute pancreatitis is usually due to complications of which of the following?
   a. Intrapancreatic inflammation
   b. Extrapancreatic inflammation
   c. Necrotizing pancreatitis
   d. Systemic metabolic derangement
4. Which of the following is true regarding the negative nitrogen balance that may occur in more severe forms of acute pancreatitis?
   a. The negative nitrogen balance is a result of hypometabolism and decreased gut function
   b. The negative nitrogen balance is often associated with poor clinical outcomes
   c. The negative nitrogen balance is indicative of systemic infection
   d. The negative nitrogen balance serves as a protective mechanism by preventing stimulation of secretion of pancreatic fluids
5. The guidelines from both the American College of Gastroenterology and the American Society for Parenteral and Enteral Nutrition favor what therapy for patients with acute pancreatitis who require nutritional support?
   a. Enteral nutrition as the initial route of nutritional support
   b. Parenteral nutrition as the initial route of nutritional support
   c. Initiation of enteral nutritional support
   d. Completion of a formal nutritional needs assessment
6. Which of the following best explains why hyperglycemia occurs in patients receiving parenteral nutrition?
   a. Blood glucose levels are directly increased by the infusion of dextrose.
   b. Blood glucose levels are indirectly increased by exogenous secretion of digestive enzymes.
   c. Blood glucose levels are directly increased by the inflamed pancreatic cells' inability to secrete adequate amounts of insulin.
   d. Blood glucose levels are indirectly increased by reduced absorption of dextrose.
7. The analysis of the randomized controlled trials reviewed by the author revealed what difference in mortality rates between patients given enteral nutrition and those receiving parenteral nutrition?
   a. Mortality rates of patients receiving parenteral nutrition were slightly higher.
   b. Mortality rates of patients receiving enteral nutrition were slightly higher.
   c. Mortality rates of patients receiving parenteral nutrition were significantly higher.
   d. Mortality rates did not differ between the 2 groups.
8. The American College of Gastroenterology guidelines for treatment of patients with acute pancreatitis recommend daily administration of proton pump inhibitors for which group of patients?
   a. Those who have extrapancreatic inflammation
   b. Those who require nutritional support by the parenteral route
   c. Those with necrotizing pancreatitis
   d. Those with systemic inflammatory response syndrome
9. The role of a critical-care nurse involved in the care of a patient with gastrointestinal disease should include which of the following?
   a. Performing formal nutritional screening to evaluate patients' nutritional needs
   b. Establishing clinical guidelines for initiation of nutritional support within 48 hours of hospital admission for all patients with severe acute pancreatitis
   c. Using reliable scoring systems to identify and indicate the severity of acute pancreatitis
   d. Recommending a change from enteral to parenteral nutrition for patients with severe malnutrition who have diarrhea lasting longer than 3 days
10. What should occur 48 hours after hospital admission for a patient with mild to moderate acute pancreatitis?
    a. Initiation of small amounts of oral feedings
    b. Reassessment of inflammatory stress marker levels
    c. Initiation of enteral nutritional support
    d. Completion of a formal nutritional needs assessment
11. Which of the following statements regarding C-reactive protein levels in acute pancreatitis is true?
    a. Levels of C-reactive protein are unreliable within the first 72 hours of the disease.
    b. C-reactive protein levels are useful in determining the extent of intrapancreatic inflammation specifically.
    c. Decreasing levels of C-reactive protein within the first 72 hours of severe acute pancreatitis signal multiple-organ damage and impending failure.
    d. The plasma concentration of C-reactive protein is a sensitive, but nonspecific marker of inflammation.
12. Which indicator of resolution of acute pancreatitis occurred more rapidly in patients who received enteral nutrition than in patients who received parenteral nutrition?
    a. Return of serum enzyme levels to normal
    b. Ability to start an oral diet
    c. Relief of epigastric pain
    d. Restoration of metabolic balance

**Program evaluation**

<table>
<thead>
<tr>
<th>Objective 1 was met</th>
<th>Objective 2 was met</th>
<th>Objective 3 was met</th>
<th>Content was relevant to my nursing practice</th>
<th>My expectations were met</th>
<th>This method of CE is effective for this content</th>
<th>The level of difficulty of this test was:</th>
<th>To complete this program, it took me _______ hours/minutes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>easy</td>
<td>12.5</td>
</tr>
</tbody>
</table>

(name) (Member #) (Address) (City, State, ZIP) (Country) (Phone) (E-mail) (RN Lic. 1/Str) (RN Lic. 2/Str) (Payment by: Visa M/C AMEX Discover Check) (Card #) (Expiration Date) (Signature)
Elaine Siow

Enteral Versus Parenteral Nutrition for Acute Pancreatitis

Crit Care Nurse 2008;28 19-30
Copyright © 2008 by the American Association of Critical-Care Nurses
Published online http://ccn.aacnjournals.org/

Personal use only. For copyright permission information:
http://ccn.aacnjournals.org/cgi/external_ref?link_type=PERMISSIONDIRECT

Subscription Information
http://ccn.aacnjournals.org/subscriptions/

Information for authors
http://ccn.aacnjournals.org/misc/ifora.xhtml

Submit a manuscript
http://www.editorialmanager.com/ccn

Email alerts
http://ccn.aacnjournals.org/subscriptions/etoc.xhtml